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Factors Associated with Failure of Conversion Among Tuberculosis Patients

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Background: Mycobacterium tuberculosis is a bacterium that causes pulmonary tuberculosis. Pulmonary tuberculosis is still a health problem in Indonesia. One of the tuberculosis control program evaluation is by looking at the results of the conversion after intensive treatment that is 80%. The conversion rate in Semarang during the last four years is still below the target. The study was aimed to identify risk factors related to the conversion failure acid-fast bacilli (*AFB*) smear positive in Semarang. *Method*: A case-control study design using data from the *TB-03* form in all health center in Semarang City (37 HC) and interview the respondents were already taking medicine for two months since the diagnosis of tuberculosis. The subjects were 51 cases (smear is still positive after the intensive phase) and 51 controls (smear negative after the intensive phase of treatment). *Results*: Most of the conversion failure occurred most in the age range 50–54 years (19.6%), the majority of work was private employees (33.33%). Risk factors that statistically significant related to the sputum conversion failure are attitude (OR 4.8; CI95% = 1.2 to 19.1), regularly take medication (OR 8; CI95% = 2.6 to 24.5), how to take medication (OR 4; CI95% = 1.3 to 12.5), nutritional status (OR 5.8; CI95% = 1.8 to 17.9), and DOTS (Directly Observed Treatment Shortcourse) program (OR 3.3; CI95% = 1.2 to 9.5). *Conclusion*: The incidence of pulmonary tuberculosis conversion failure influenced by the attitude of the patient, regularity of taking medication, how to take the medicine, nutritional status and support from medication home-based supervisor.

Keywords: Sputum, Conversion Rate, Tuberculosis, Failure.

1. INTRODUCTION

Tuberculosis is an infectious disease of the respiratory system caused by Mycobacterium tuberculosis to the part of the lung parenchym.[1] Pulmonary tuberculosis covers 80% of the total incidence of tuberculosis, while the remaining 20% is extrapulmonary tuberculosis. Estimated that one-third of the world's population infected with the *Mycobacterium tuberculosis*.[1,2] Tuberculosis is transmitted through the air (droplet nuclei).

If the patient coughs, sneezes or talks when dealing with other people, the tuberculosis bacillus ejected and inhaled in the lungs of healthy people. The incubation period for 3–6 months.[1] A person diagnosed as a suspect tuberculosis if found on his/her main clinical symptoms such as cough with phlegm for more than three weeks, coughing up blood, shortness of breath and chest pain.[1,3,4] Tuberculosis control programs currently undertaken by the Ministry of Health Republic of Indonesia/MoH RI by using the DOTS (Directly Observed Treatment Shortcourse) which had been recommended by the WHO[5] as a comprehensive strategy to be used by primary health service.[5] Indonesia began using DOTS strategy and implemented through the community/public health centers (*Puskesmas*) in 2000. One indicator of the tuberculosis program evaluation is the conversion rate of less than 80%.[6] Conversion is a change that occurs in patients with tuberculosis BTA positive to smear negative after two months of the intensive phase of treatment. The low conversion rate is a problem that needs to be considered, because of concerns about the healing process patient.[5,7] Conversion measured by the total number change of patient with smear positive to smear negative through the laboratory examination. Based on Global Tuberculosis Report 2014, the world conversion rate was 83%.[8]

In Indonesia, the conversion rate was 86.2% (2005), 87.1% (2006), 88.1% (2007), 88.1% (2008), 88.7% (2009), 87% (2010), and 94.8% (2011) respectively.[9] However in 2012, it dropped to be 83.7%. Twelve provinces out of 22 provinces in Indonesia achieved the target of 80% conversion rate. The conversion rate of Central Java province in 2011 was 88.7% and decreased to 83.7% in 2012.[10]

Based on the health profile of Semarang City in 2013 conversion rate was 56.7% (635 cases) out of 1120 BTA (+). The figure decreased by 15.3% from 2012. In 2014 the conversion rate increased to 73%.[11] In 2014 there were 32 HC out of the 37 HCs in Semarang City failed to achieve targeted conversion rate. Potentially, those failed would cause in direct

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transmission to the surrounding communities resulting in increased case.[12]

Factors affecting the conversion failure of TB patients are internal and external factors. Internal factors are factors related to the characteristics and behavior of the patient's own, such as age, education, smoking behavior, while external factors are environmental factors or social factors that are in the vicinity of the patient such as housing conditions, the role of supervisor to take medicine, the role of medical personnel, compliance take medicine etc.[6,7,13,14] Based on previous research there are many factors related to the conversion failure pulmonary tuberculosis such as regularity of taking medications, level of knowledge, level of education, counseling, drug side effects, nutritional status, means taking anti-tuberculosis drugs, support supervisor taking medication, smoking behavior and attitudes of patients against taking medicine.[12,13,15]

2. METHOD

2.1. Study Design

This research was explanatory research using data from the *TB-03* form and interviews the respondents were already taking medicine for two months since the diagnosis of tuberculosis. This study used a case-control approach.

2.2. Study Site

All Health Centre (HC) in Semarang city (37), Central Java Province, Indonesia.

2.3. Population and Sample

Samples of this study obtained from the calculation formula the sample consisted of 51 cases and 51 controls.

2.4. Subject of Study

Case was a group of patients as respondents who did not undergo conversion changes BTA tuberculosis, smear positive means remains to be positive. The control group in this study was a group of people as respondents who experienced conversion *BTA* tuberculosis, which means the positive smear has become negative.

2.5. Variable

We interviewed subject using questionnaire contains question about level of education, counseling, The attitude of people towards regularity of taking medicine, Regularity of taking medicine, Drug Side Effects, How to take medicine, comorbid, nutrition, smoking behavior, and support from medication home-based supervisor.

2.6. Data Analysis

It was a multivariate analysis using backward elimination.

2.7. Ethical Consideration

Participants were given choice not to participate in the study. Anonymity was assured by not collecting individual details related to name, health center or hospital. Ethical clearance was obtained from the Commission of Ethics of Medical and Public Health Research, Faculty of Public Health, Diponegoro University.

3. RESULTS

The results showed that 82.4% of people with TB were examined in this study already have a higher education. Tuberculosis patients who did not get counseling (74.5%) were more than that who did not get counseling. Also, the results of 102 patients with tuberculosis in the city of Semarang showed only 23.5% that had an attitude not conducive to the regularity of taking the drug; it is smaller than that having a supportive stance towards regularity of taking medicine.

The results also showed 51% of tuberculosis patients are already taking medication regularly. Additionally, the table indicates 59.8% of patients with tuberculosis in the city of Semarang the respondents did not feel the side effects of drugs. Patients with tuberculosis in the city of Semarang were 62.7% taking medication correctly and 89.2% of patients with tuberculosis in the city of Semarang did not have comorbidities.

The result stated 43.1% of patients with tuberculosis in the city of Semarang who were respondents in this study were malnourished. On the table also shows 16.7% of patients with tuberculosis in the city of Semarang who were respondents in this study smoking behavior and 51% of patients with tuberculosis in the city of Semarang's study who has supported by passive medication home-based supervisor. The result of the bivariate analysis showed that factors associated with tuberculosis conversion failure are the regularity of taking medicine, attitude towards the regularity of taking medication, side effects of drugs, by taking anti-tuberculosis drugs and DOTS program. However, after multivariate analysis (Table I) several variables such as attitudes toward regularity of taking medications, regularity of taking medications, how to take the medicine, the nutritional status, support from medication home-based supervisor were associated with failure of conversion smear positive among tuberculosis patient in the intensive treatment phase.

4. DISCUSSION

Patients who have the attitude to believe that the treatment of tuberculosis are unable to treat lead they cannot survive in the treatment and continue their life as normal as usual.[13,16] Patients who have the attitude that tuberculosis is a contagious disease that can be treated to increase the motivation of patients to regularly taking medication.[15] High motivation will increase the regularity in treatment that determines the outcome of treatment.[17] Attitude of patients affected by external and internal factors, external factors including environmental, social support, etc., while the internal factors including experience, education, etc. Support of medication adherence supervisor to take medication was a relative of the patient itself.

The regularity of taking drugs will affect the permeability of the cell wall. Drugs taken will effectively kill germs that divide where anti-tuberculosis drugs work this will increase the permeability of the bacterial cell wall making it easier for drugs to get into the bacterial cell. Anti-tuberculosis drugs would inhibit the synthesis of nucleic acid that inhibits transcription of DNA in a way bound to the RNA polymerase that catalyzes DNA. At the beginning of the first week of treatment of bacterial DNA level will have to take less medication.[18] Regularity will affect the treatment. Treatment will affect whether or not the conversion failed and tuberculosis.[17]

Table I. Factors associated with failure of conversion smear positive among tuberculosis patient in Semarang city, 2015.

		Case		Control		Total				
		n	%	*n*	%	*n*	%	*p*-value	OR	95%CI
1	Level education									
	a. Low	10	19.6	8	15.7	18	17.6			
	b. High	41	80.4	43	82.4	83	82.4	0.795	1.5	0.5–3.6
	Total	51	100.0	51	100.0	102	100.0			
2	Counseling									
	a. There is no	39	76.5	37	72.5	76	74.5			
	b. There is	12	23.5	14	27.5	26	25.5	0.820	1.2	0.5–3.0
	Total	51	100.0	51	100.0	102	100.0			
3	The attitude of people towards regularity of taking medicine									
	a. Does not support	18	35.5	6	11.8	24	23.5	0.027	4.8	1.2–19.1
	b. Support	33	64.5	45	88.2	78	76.5			
	Total	51	100.0	51	100.0	102	100.0			
4	Regularity of taking medicine									
	a. Irregular	35	68.6	15	29.4	50	49	<0,0001	8.0	2.6–24.5
	b. Regular	16	31.4	36	70.6	52	51			
	Total	51	100.0	51	100.0	102	100.0			
5	Drug side effects									
	a. Weight	6	11.8	1	2.0	7	6.9	0.044		
	b. Light	20	39.2	14	27.5	34	33.3	0.038	9.5	1.1–84.7
	c. There is no	25	49.0	36	70.6	61	59.8	Comparison	2.4	1.1–5.7
	Total	51	100.0	51	100.0	102	100.0			
6	How to take medicine									
	a. False	26	51	12	23.5	38	37.3			
	b. Correct	25	49	39	76.5	64	62.7	0.018	5.8	1.8–17.9
	Total	51	100.0	51	100.0	102	100.0			
7	Comorbidities									
	a. Yes	7	13.7	4	7.8	11	10.8	0.523	1.9	0.5–6.8
	b. No	44	86.3	47	92.2	91	89.2			
	Total	51	100.0	51	100.0	102	100.0			
8	Nutrition									
	a. Abnormal	30	58.8	14	27.5	44	43.1			
	b. Normal	21	41.2	37	72.5	58	56.9	0.003	5.8	1.8–17.9
	Total	51	100.0	51	100.0	102	100.0			
9	Smoking behavior									
	a. Smoking	7	13.7	10	19.6	52	51			
	b. Do not smoking	44	86.3	41	80.4	50	49	0.595	0.6	0.2–1.9
	Total	51	100.0	51	100.0	102	100.0			
10	Support from medication home-based supervisor									
	a. Passive	37	72.5	15	29.4	52	51			
	b. Active	14	27.5	36	70.6	50	49	0.023	3.3	1.2–9.5
	Total	51	100.0	51	100.0	102	100.0			

The occurrence of mild or severe side effects may cause patients to stop taking the drug partly or entirely when the incidence of drug side effects are not reported and immediately managed by a health worker. The shutdown will cause the patient to take medication regularly not take medication that could eventually lead to reduced healing process, ultimately conversion failure occurs. When you stop for more than two weeks can cause a dropout. Management of adverse drug events needs to be handled properly either by health officials.

In this study, one aspect of the assessment is a way of taking medication to take medication. Most respondents consumed the drug when the stomach is in a state still no food, but effective tuberculosis drug absorbed on an empty stomach.

Malnutrition can lower resistance to Mycobacterium tuberculosis. Malnutrition adversely affects the healing process and the duration of the treatment process. Inadequate nutrition will result in metabolic stress due to infection of tuberculosis germs that will cause weight loss and cell damage vital organs of the body parts that can cause a lack of endurance pulmonary tuberculosis patients. Therefore, nutrients are very important in improving endurance. Regarding nutrition to note the quality of the food consumption determined by the species composition of food.[19]

Support of a treatment supporter is the external factors in the environment that affect the behavior of individual patients with pulmonary tuberculosis. One component of the DOTS program is a tuberculosis prevention program in Indonesia is antituberculosis treatment regimens short-term supervised by the PMO to ensure the completion of the Supervisory the treatment of swallowing the drug has an important role in motivating the patient[20] when to take medication, reminds patients to check the sputum, pay attention to nutrition and remind schedule patient visits to health care units.

5. CONCLUSION

The results showed that factors associated with conversion failure of tuberculosis were

1. attitude of taking medications regularly,
2. order in taking medication correctly,
3. how to take the medicine correctly,
4. the side effects of drugs,
5. patients' nutritional status, and
6. Support from medication home-based supervisor.

Health workers are advised to motivate patients to complete treatment and explain to the patient that tuberculosis is a curable disease. In addition to health workers actively participate in controlling the regularity of patients taking the medicine and encourage patients to take medication with rewards that are regularly taking medication regularly. We also recommends notification as if it is related with medication.

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